

EuroSpec



Specification sliding steps

V1.1



Specification sliding steps

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© Société Nationale des Chemins de fer Français (SNCF), the Association of Train Operating Companies (ATOC), Deutsche Bahn (DB), Nederlandse Spoorwegen (NS), Danske Statsbaner (DSB), Österreichische Bundesbahnen (ÖBB), Schweizerische Bundesbahnen (SBB)

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Issue Record

Issue	Date	Comments	Source
1	June 2016	First draft of the specification	EuroSpec "Requirements for sliding steps on trains"

Revision History

Version	Date	Change
1.1	December 2016	<ul style="list-style-type: none">▪ References in chapter 7 corrected▪ SLST.2 – 'horizontal direction' replaced by 'y-direction'▪ SLST.30 – 'obstacle' replaced by 'platform'▪ SLST.103 – typo removed▪ SLST.17, SLST.28, SLST.31 – verification 'x' added▪ Pg. 5, safety responsibilities: SBB added▪ Chpt. 8 – references to TSI corrected▪ Chpt. 5, "final position" – 'x-direction replaced' by 'y-direction'▪ Section 3.5 and subsection 3.3.2: footnotes added

1 FOREWORD

EuroSpec is a group of European train operating companies providing harmonised product specifications for use in train procurement and refurbishment. The main target is to improve the reliability and quality of trains by using common and standardised functional and non-functional specification and verification methods. The benefits of using EuroSpec:

- Increase of reliability by sharing good practice and experience;
- Simplification of the tender process in time and cost as a result of fewer variations in requirements between tenders;
- Standardised products and cost reduction due to harmonisation of train operators' requirements.

The EuroSpec specifications comprise merged functional and product basic requirements. All EuroSpec specifications focus on technical aspects exclusively based on the existing national requirements. A EuroSpec specification is a voluntary specification designed to be used within the European region. The primary field of application is the European rolling stock domain and all associated interfaces. Regarding the hierarchy this common specification can be positioned as follows, in order of prevalence:

- EN standards
- UIC/ UNIFE Technical Recommendations (TecRecs)
- UIC Codes (leaflets)
- EuroSpec Specifications
- Company Specifications

2 INTRODUCTION

This document is a voluntary specification, produced by Société nationale des chemins de fer français (SNCF), the Association of Train Operating Companies (ATOC), Deutsche Bahn (DB), Österreichische Bundesbahnen (ÖBB) and Schweizerische Bundesbahnen (SBB). Individual companies may choose to mandate it through internal instructions/procedures or contract conditions. Purpose of this document

- This document provides a voluntary specification for “sliding steps.” for use by companies in the rail sector if they so choose.
- The document is set out in the same format as EN standards including, where appropriate, normative and informative annexes in order to facilitate the interface with Euro Norms.

Application of this document

- This specification is voluntary. Individual companies may however elect to mandate all or part of its use through company procedures or contract conditions. Where this is the case, the company concerned must specify the nature and extent of application.
- Specific compliance requirements and dates of application have therefore not been identified since these will be the subject of the internal procedures or contract conditions of those companies that choose to adopt this standard.

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3 SCOPE

This specification is applicable for rolling stock units that are equipped with sliding steps. The purpose of this document is to provide a common specification for sliding steps in rolling stock units between operators. This document is to replace individual company specific functional requirements and constitutes a common reference being used for tendering and verification. This specification is an add-on to the Technical Specifications of Interoperability (TSI). Besides this specification additional operator specific specifications might be defined. The specification contains requirements on system level of the sliding steps and its interfaces, and unifies the requested performances of the different operators. This specification is not intended to block innovation or to prevent improvement. For this purpose each requirement is preceded by an objective. If applicable, the requirements are referenced to the EN 15380 structure. It is foreseen that more requirement sets and European standards will make use of this common reference structure.

4 NORMATIVE REFERENCES

Refer to chapter 8.

5 TERMS, DEFINITIONS AND ABBREVIATIONS

TSI	Technical specification for interoperability
EN	EuroNorm
TEN	Tran European Network
Final position	For each cycle, the position in y-direction where step movement is completed and the step is secured. This can be anywhere between A and D (see Figure 4).
Sliding step secured	Movement is mechanically inhibited. The sliding step does not react to any extension command.
Cassette	A self-contained construction, in which all parts of the sliding step system are located, except the step control unit and the out-of-service device.
Override protection	An equipment of the sliding step preventing that the sliding step will set down on the platform.
Sliding step out of service	A mode of the sliding step where: <ul style="list-style-type: none"> • the sliding step is in position D (see Figure 4), • the green loop is bridged and • any signal for extension is ignored.

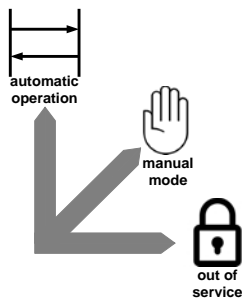
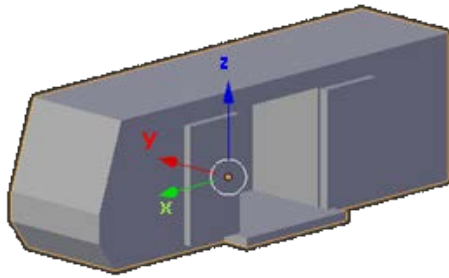


Figure 1 Positions of out of service device

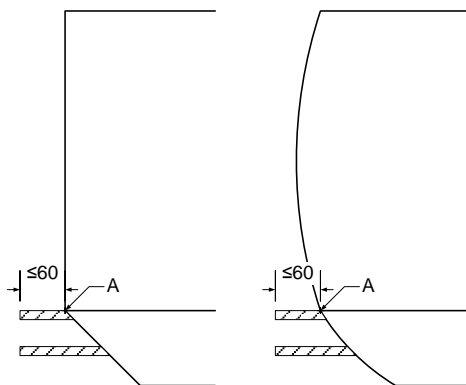


z = in car body height

y = in carbody width

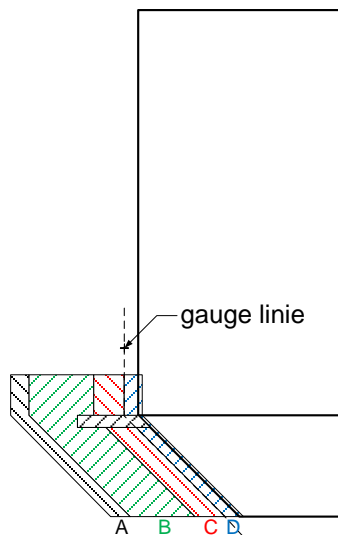
x = in the car body longitudinal axis

Figure 2 coordinate system with reference axes



The in figure 3 illustrated point A is the starting point for measuring the length of the sliding step. Regardless of whether the sliding step is at this level, or if the car body is cambered.

Figure 3 Location of the measurement point A



- **A** maximum stroke of the sliding step
- **B** range between minimum and maximum usable extension distance
- **C** minimum usable extension distance (y_{thr})
- **D** retracted and secured

Figure 4 Positions of the sliding step

Table 1 List of settable parameters

	Parameter	Value range	Also refer to
1	Number of reversal attempts	$0 \leq X \leq \infty$	SLST.25, SLST.28
2	The time the sliding step remains extended in case of automatic door closing while at the platform	$0 \leq t \leq \infty$	-
3	Threshold extension distance	$0 \leq y_{thr} \leq y_{stroke}$	SLST.23, SLST.24, SLST.25
4	Maximum extension distance	$0 \leq y_{max} \leq y_{stroke}$	-
5	Movement velocity for step extension distance $y < 50$ mm	$v_1 \geq v_2$	-
6	Movement velocity for step extension distance $y > 50$ mm (taking into account the max. forces specified in EN14752, section 5.4.2)	$v_2 \geq 0.1$ m/s	-
7	Fixed extension distance	$0 \leq y_{fix} \leq y_{stroke}$	SLST.30
8	For each detection method/direction: retraction distance after obstacle or platform detection	$0 \leq y_r \leq y_{stroke}$	SLST.24, SLST.26, SLST.25, SLST.31

6 SPECIFICATIONS

This chapter describes the requirements and their objectives. For several requirements verifications are included. Verification describes how compliance to the requirement will be verified.

The columns of the specification are subsequent defined:

ID

- Unique Identification of the requirement

Requirement classification

- Importance and legal status of the requirement to the project to differentiate between the requirements with regard to relevance and legal status like Requirement (RE - mandatory), Operator Specific Requirement (OSRE – mandatory; necessary input provided by operator), Design Recommendation (DR) or Optional Requirement (OR).

Requirement-text

- Description of the requirement

Rational

- Reason to state the requirement

Verification

- Verification type and point of time
- Details of the definitions can be found in the document “EuroSpec Requirements Management” at www.eurospec.eu

ID	Requirement classification	Requirement text	Rationale
		1) Introduction	
SLST.1	INFO	This specification is an addition to EN 14752 and TSI PRM and contains specific items which operators encounter during the operation.	Scope of EuroSpec Sliding Steps.
		2) Definitions and standards	
SLST.2	INFO	A sliding step is a bridge plate as defined in EN14752:2015, with the addition that the sliding step only moves in y-direction, and performs no rotation- or folding move.	EuroSpec has to be consistent with other existing norms.
SLST.3	INFO	The coordinate system used to indicate directions throughout this specification is shown in figure 2.	Easy readability.
SLST.4	RE	The sliding step shall comply with EN 14752.	Consistent with SLST.1.
SLST.5	RE	The sliding step shall comply with EN 16584-1.	Norm is not yet mandatory in TSI PRM.
SLST.6	RE	The sliding step shall comply with EN 16584-3.	Norm is not yet mandatory in TSI PRM.

Verification				
Offer of Tenderer(s)	Design Review	FAI ¹	FII ²	Take-over
X	X	X	X	
X	X	X	X	
X	X	X	X	


¹ First Article Inspection FAI of components


² First Integration Inspection

ID	Requirement classification	Requirement text	Rationale	Verification				
				Offer of Tenderer(s)	Design Review	FAI ¹	FII ²	Take-over
		3) Functional & performance requirements						
SLST.7	INFO	This section contains the requirements regarding the primary functionalities of the sliding step: extension, retraction, platform detection and obstacle detection (sections 3.1), 3.2) and 3.3)). Furthermore, the requirements for the case when the sliding step has to be taken out of service are stated in section 3.4). Last, the requirements regarding the load detection functionality of the sliding step are stated in section 3.5). The operator is to indicate whether this section is applicable.	n/a					
		3.1) Extension						
SLST.8	RE	Upon receiving an extension signal from the corresponding door control unit, the sliding step(s) shall start to move without delay to its/their extended position.	"Signal from the corresponding door control unit" marks a clear system boundary. The trigger for this system may vary depending on the operator & type of operation. Examples of triggers: Do all steps extend? Is an additional local command 'open door' required (given by the passenger)? Automatic opening of wheelchair doors?		X		X	
SLST.9	OSRE	When a door is centrally enabled, the sliding step shall a) extend when an additional local command is given (e.g. passenger push button) <u>or</u> b) extend without an additional local command. This setting shall be adjustable in the step control unit during the lifetime of the train.	Requirement to internal design of step control unit. It is useful to be able to change the logic during the lifetime of the train without having to replace the step control unit. E.g. when train is operated in different region or with different operation type.		X		X	

ID	Requirement classification	Requirement text	Rationale	Verification				
				Offer of Tenderer(s)	Design Review	FAI ¹	FII ²	Take-over
SLST.10	OSRE	When extending, the sliding step shall perform one of the following sequences: a) step extends; door starts moving when step has reached its final position. <i>or</i> b) step extends; door starts moving such that a clear width of $x \leq 400$ mm is reached when the step has reached its final position.	Subject is mentioned in TSI and EN, explicitly mentioned here to indicate that a choice must be made by the operator. See rationale of SLST.14.		X		X	
SLST.11	RE	The sliding step shall extend to its final position (including reversal if required by type of system) within $t \leq 3$ s under the following conditions: <u>Measurement boundaries</u> - a platform at distance 300 mm; - start of measurement: incoming signal into step; - end of measurement: outgoing signal out of step. <u>Measurement conditions</u> - Normal weather conditions, i.e. no ice. - For steps without contactless platform detection: step shall touch platform with edge, not with override protection.	To minimize the time taken for step movement. A reference measurement that shall be fulfilled by all steps regardless of stroke length, type of obstacle detection and reversing behaviour. This is the only way to have one common requirement.			X		
SLST.12	RE	The sliding step, while extending, shall move with a mean speed of at least 0.1 m/s.	For sliding steps (and doors), there is a relation between weight, speed and maximum touching force. This speed is technically feasible. A lower speed is undesirable. SLST.12 ensures that steps which can fulfil SLST.11 in <3 s are not unnecessarily slow.		X	X		
SLST.13	OSRE	When a sliding step reaches its maximum stroke without detecting an obstacle or a platform during extension, the sliding step shall a) retract to an extension distance of y_{ed} mm <i>or</i> b) retract by a distance of y_r mm.	This is the definition of the "perfect extension", i.e. an extension without obstacle detection. The behaviour of the step depends on the operator, type of operation and infrastructure. The step retracts to prevent contact with the platform, due to movement of the train with changing loads (up, down, and tilting).		X	X		

ID	Requirement classification	Requirement text	Rationale	Verification				
				Offer of Tenderer(s)	Design Review	FAI ¹	FII ²	Take-over
3.2) Retraction								
SLST.14	RE	Upon receiving a retraction signal from the corresponding door control unit, the sliding step(s) shall start to move without delay into its/their retracted position.	"Signal from the corresponding door control unit" marks a clear system boundary. The trigger for this system may vary depending on the operator & type of operation.		X		X	
SLST.15	OSRE	When retracting, the sliding step shall perform one of the following sequences: a) door closes; step begins to retract when the door is completely closed. <i>or</i> b) door closes; when the door opening reaches a clear width of $x \leq 400$ mm the step begins to retract.	Subject is mentioned in TSI and EN, explicitly mentioned here to indicate that a choice must be made by the operator. See rationale of SLST14.		X		X	
SLST.16	RE	The sliding step, while retracting, shall move with a mean speed of at least 0.1 m/s.	Consistent with SLST.12. This speed is technically feasible. A lower speed is undesirable. There is a relation between weight, speed and maximum touching force.		X	X		
3.3) Obstacle and platform detection								
SLST.17	RE	The sliding step shall have obstacle detection by contact (e.g. motor current, sensitive edge).	Obstacle detection by contact is required. Refer to requirements in section 3.3.1.	X				
SLST.18	RE	The obstacle detection functionality is always active while the step is extending or retracting.	Safety.		X	X		
SLST.19	RE	The obstacle detection shall always have the highest priority (e.g over platform detection).	Safety.		X		X	
SLST.20	OSRE	The sliding step shall have the following platform detection system(s): a) platform detection by contact (motor current, sensitive edge, ...) <i>and/or</i> b) contactless platform detection (infra-red, laser, ultrasound, ...).	Applied technology depends on train type, type of service and operator philosophy. For a), refer to requirements in section 3.3.1. For b), refer to requirements in section 3.3.2.	X if not specified by operator	X	X	X	

ID	Requirement classification	Requirement text	Rationale	Verification				
				Offer of Tenderer(s)	Design Review	FAI ¹	FII ²	Take-over
SLST.21	INFO	The technology of the platform detection system depends on the type of train operation and the level of autonomy required.	Applied technology depends on train type and type of service.					
SLST.22	OSRE	The obstacle detection system and platform detection system may be the same system.	Not all operators distinguish between obstacle detection and platform detection.	X if not specified by operator	X			
		3.3.1) Touching obstacle detection and/or platform detection						
SLST.23	INFO	Depending on the distances between car body and platform that can occur during operation, there will be a threshold value y_{thr} for the extension distance.	n/a					
SLST.24	OSRE	When a sliding step is extended by $> y_{thr}$ mm and detects a platform or an obstacle, the sliding step shall retract by y_r mm and stop.	 <p>Different train types and types of operation ask for a specific response of a step after obstacle/platform detection.</p> <p>SLST.24 and SLST.25 take into account that the reaction of the step to obstacle/platform detection depends on the distance the step has already extended at the moment of detection.</p>		X	X		
SLST.25	OSRE	<p>When a sliding step is extended by $< y_{thr}$ mm and detects a platform or an obstacle, the step shall start the obstacle detection cycle:</p> <ul style="list-style-type: none"> - the step movement stops; - the step retracts by y_r mm; - after a waiting time of x seconds, the sliding step starts to extend again. <p>After X obstacle detection cycles, the sliding step retracts completely.</p>	<p>Different train types and types of operation ask for a specific response of a step after obstacle/platform detection.</p> <p>SLST.24 and SLST.25 take into account that the reaction of the step to obstacle/platform detection depends on the distance the step has already extended at the moment of detection.</p>		X	X		

ID	Requirement classification	Requirement text	Rationale	Verification				
				Offer of Tenderer(s)	Design Review	FAI ¹	FII ²	Take-over
SLST.26	OSRE	When a sliding step detects by contact that it is overriding a platform edge, the sliding step shall retract by y_r mm and stop.	 <p>Different train types and types of operation ask for a specific response of a step after override detection.</p>		X	X		
SLST.27	RE	Under no circumstances shall the sliding step come to rest on the platform top surface (e.g. despite varying inclination, load, wheel diameter, ...).	The supplier must take into account all encountered platform heights and distances.	X	X	X		
SLST.28	RE	When a sliding step retracts and detects an obstacle by e.g. motor current, the step shall: - stop the step movement; - extend by y_e mm (≥ 0); - after a waiting time of x seconds, start to retract again. After X cycles, the sliding step shall stay in its position and give a diagnosis message.	Detection of e.g. stones when retracting.		X	X		
3.3.2) Contactless platform detection³								
SLST.29	RE	The sliding step shall recognize by means of a contactless sensor system how far it shall extend.	Choice for this system is made in SLST.20 if applicable. Section 3.3.2 is n/a for all operators.	X	X	X	X	
SLST.30	OSRE	The contactless platform detection functionality shall be overruled if the driver gives the command - "do not extend steps"; or - extend sliding step to an extension distance of y_{ed} mm.	Driver shall have the possibility to give a command to not extend or extend by a predefined distance set per train set. In this case, the step intelligence is deliberately disregarded. Required due to safety reasons in some exceptional situations (e.g. exceptional stop in tunnel).		X		X	

³ The applicability of this subsection shall be indicated by the operator.

ID	Requirement classification	Requirement text	Rationale	Verification				
				Offer of Tenderer(s)	Design Review	FAI ¹	FII ²	Take-over
SLST.31	OSRE	When a sliding step detects by contactless platform detection that it is overriding a platform edge, the sliding step shall retract by y, mm and stop.	Analogous to SLST.26.		X	X		
3.4) Step out of service								
SLST.32	INFO	The out-of-service device is accessible to train staff. By operating this device, the out-of-service mechanism inside the step cassette is activated.	n/a					
SLST.33	RE	Each sliding step shall have an out-of-service device to lock a sliding step manually out of service.	Each step can be put out of service separately.		X	(X)	X	
SLST.34	OSRE	The out-of-service device shall be located: a) inside the train <i>or</i> b) outside the train; <i>or</i> c) inside and outside.	a) staff do not have to leave train to an unsafe situation; b) in order not to have leak in pressure-tight train; useful on crowded trains; c) flexibility (outside may be difficult to access when at platform).	X if not specified by operator	X		X	
SLST.35	RE	If placed inside the train, the out-of-service device shall be located at a height between 400 mm and 600 mm above the floor level.	Addition to TSI requirement. Very long Bowden cables should be prevented. Device shall not be in the floor, nor near passenger push buttons.		X		X	
SLST.36	RE	The operating torque of the out-of-service device shall be ≤10 Nm.	Equal to force to operate external emergency device for doors (EN14752 - sec 5.5.3.2.2)		X		X	
SLST.37	RE	The out-of-service device shall have the positions 'automatic operation', 'manual operation', 'out-of-service'.	Clear definition of 3 required positions.		X	X		
SLST.38	RE	The positions shall be located around the out-of-service device as shown in figure 1.	Standardization; same arrangement as for door locking device.		X	X		
SLST.39	RE	With the out-of-service device in position "manual operation", the sliding step shall be retractable manually without any tools.	To avoid having to take the train out-of-service. Also used for maintenance purposes.		X	X	X	
SLST.40	RE	The operating force to manually push in the sliding step shall be lower than 150 N.	For doors, it is 150 N as well.		X	X	X	

ID	Requirement classification	Requirement text	Rationale	Verification				
				Offer of Tenderer(s)	Design Review	FAI ¹	FII ²	Take-over
SLST.41	RE	The position 'out-of-service' shall not be accessible when the sliding step is not fully retracted.	Locking mechanism shall always ensure a retracted and secured position in the position 'out-of-service'.		X	X		
SLST.42	OSRE	The out-of-service locking mechanism shall always ensure a safe retracted position in the position 'out of service'. The out-of-service locking mechanism shall be: a) based on the main locking mechanism <i>or</i> b) different and fully independent from the main locking mechanism.	Objective: locking device shall always ensure a retracted position in the position 'out-of-service', to avoid unnecessarily taking a train out-of-service. At this point, the required design solution is operator-specific.	X if not specified by operator	X	X		
SLST.43	OR	Optional: With respect to wheelchair user access, a sliding step which is out-of-service inhibits the extension of the sliding step on the opposite side of the carriage.	To prevent wheelchairs users to get in, and consequently not be able to get out at the next station. Note: an operational procedure to assist wheelchair users already on board will need to be available.		X		X	
SLST.44	RE	Taking the sliding step out-of-service (i.e. unlocking, manual retraction, locking) shall take no longer than 10 s.	In order not to affect the operation.		X		X	
SLST.45	RE	In an area not visible to passengers (e.g. inner side of the door post, cover of the door drive etc.) a well-structured, easy to understand instruction on how to lock the step out-of-service shall be attached.	To prevent secondary failures due to incorrect operation.		X		X	
SLST.46	OR	Optional: The supplier shall make the instruction on how to take the sliding step out-of-service available (also) for use on the portable device carried by the train staff, e.g. the ticket control device.	Sliding step prepared for the future.		X		X	

ID	Requirement classification	Requirement text	Rationale	Verification				
				Offer of Tenderer(s)	Design Review	FAI ¹	FII ²	Take-over
		3.5) Load detection⁴						
SLST.47	INFO	Rules of national authorities or the type of train service may require the sliding step to have a vertical load detection system.	EN14752 leaves open whether the load detection system is used.					
SLST.48	RE	The vertical load detection system shall detect when a static weight (as specified in annex J section 3 of EN14752) is present on the sliding step surface.	Functionality of vertical load detection.		X	X	X	
SLST.49	RE	When a static weight is detected, the vertical load detection system shall give a signal to the door control unit.	To reset door opening time.		X	X	X	
SLST.50	RE	The vertical load detection functionality shall be switched off when the sliding step is moving.	To avoid passengers playing with the step.		X		X	
SLST.51	RE	The vertical load detection functionality shall be switched off for the central closing procedure.	Vertical load detection switched off during central closing to prevent grit stuck in gap from blocking step movement.		X		X	
		4) Interface requirements						
SLST.52	OSRE	The sliding step shall indicate the status "retracted" by means of a limit switch. The status "secured" shall be a) included in the same limit switch <i>or</i> b) indicated by means of a second path, being a limit switch, relay or motor current.	Option a), the 2-in-1 solution, is not acceptable for all operators at this point.	X if not specified by operator	X	X		
SLST.53	OSRE	The limit switch(es) "retracted and secured" of the sliding step shall a) be connected in series to the safety loop of the door system <i>or</i> b) be part of (an) additional safety loop(s), independent from the safety loop of the door system.	Option a), the 2-in-1 solution, is not acceptable for all operators at this point.	X if not specified by operator	X	X	X	

⁴ The applicability of this section shall be indicated by the operator.

ID	Requirement classification	Requirement text	Rationale	Verification				
				Offer of Tenderer(s)	Design Review	FAI ¹	FII ²	Take-over
SLST.54	INFO	An additional safety loop is used to provide side-specific status information about the sliding step.	Explanation for SLST.53.					
SLST.55	OSRE	The edge of the sliding step in retracted and secured position shall be located between 0 and 60 mm from the car body, measured horizontally from point A, provided this position is within the gauge. Refer to figure 3.	To prevent train surfing; EN too vague (shifting the responsibility to operators).	X	X		X	
SLST.56	RE	The driver shall have the possibility to deactivate any entrance (i.e. door and step) from the cabin after the door is closed and locked and the sliding step is retracted and secured.	E.g. for metro/suburban operation where the driver is alone, or for the first and last door of coupled trains if they are too long for the platform.		X		X	
SLST.57	RE	The sliding step parameters in table 1 shall be adjustable by authorized personnel without a software update.	<p>The general rationale is standardisation and being able to do more adjustments than can be done currently without the help of the supplier. Unforeseen operational issues can be fixed immediately.</p> <p>Specifically: 4: If a difference in extension distance is required for PRM and normal doors, this parameter means that the same (long stroke) step can still be fitted at all doors, which is favourable in terms of maintainability. 5 & 6: useful parameters if test in climate chamber reveals that initially the ice cannot be broken. The parameter can be changed and the test repeated.</p>		X	X		

ID	Requirement classification	Requirement text	Rationale
		5) Physical requirements	
SLST.58	RE	Any height difference in the step surface design shall not exceed 15 mm.	Definition of the shape of sliding steps, based on meeting with "PRM representatives" who have a more restrictive requirement than TSI.
SLST.59	RE	The supplier shall provide drawings showing the platform and the extended step on both sides of the train: - for a straight track; - for a curve radius R=300m and maximum cant; - for a curve radius R=500m and maximum cant.	Experience with various projects shows that it is almost impossible to obtain these drawings later during a project.
SLST.60	RE	When the sliding step is extended, clacking noises shall not occur when somebody steps on the sliding step surface.	Customer perception.
		6) Aspect requirements	
		6.1) Failure behaviour	
SLST.61	RE	In case of a single failure, the sliding step shall remain retracted and secured while the train is in operation.	Supplier has to prove that there have to be at least two failures for the step to extend unintentionally.
		6.2) Resistance to weather and external influences	
SLST.62	INFO	This section describes the environment that the sliding step is exposed to while performing the functionalities as described in chapter 3. The measures to be taken to ensure operation are stated.	n/a
SLST.63	RE	The sliding step shall function reliably in the specified temperature range in accordance with EN 50125 and EN50155.	Minimum operating conditions under which the system has to function.

Verification				
Offer of Tenderer(s)	Design Review	FAI ¹	FII ²	Take-over
	X	X		
X	X			
	X	X	X	
	X		X	
	X	X	X	

ID	Requirement classification	Requirement text	Rationale
SLST.64	RE	The operation of the sliding step at minimum temperatures shall be tested in accordance with prEN 16251, applying an ice layer of 3 mm.	Verification of SLST.63. This could be done at the small climate chambers run by the suppliers.
SLST.65	RE	To avoid blockage by freezing due to sticking of rubber seals exposed to the external environment, silicone material shall preferably be used for these seals.	Objective is to break ice, not to achieve a specific force. Silicon material has better performance with frost. If not possible for technical reasons, other material may be used.
SLST.66	RE	The operation of sliding steps shall not be influenced by the use of grit (i.e. sand, salt or chippings) on the platform.	Grain size and type of grit varies per operator.
SLST.67	INFO	The supplier can request a sample of the operator's specific grit.	To give the supplier the opportunity to test during construction phase.
SLST.68	RE	The sliding step in the retracted position shall be sealed tight against ingress of drifting snow.	To avoid blockage.
SLST.69	RE	Ingress of water into the drive system and into the step control unit for any position of the sliding step shall be prevented.	Objective: Water should not get into the rotating or moving parts of the steps or in the switches.
SLST.70	RE	The sliding step in the retracted position shall be water tight, under any operating condition of the train, in x and -x direction, including cant.	To prevent moisture from entering the step cassette and reaching the step components.
SLST.71	RE	The sliding step in the retracted position shall be water tight in train washing plants, with the train passage performed in x and -x direction.	To prevent moisture from entering the step cassette and reaching the step components.
SLST.72	RE	The water tightness required in SLST.70 and SLST.71 shall be demonstrated according to EN 14752, Annex B, with the train passage performed in x and -x direction.	Test specified in EN for doors is suitable for steps, too.
SLST.73	RE	If a sliding step is not capable of fulfilling the requirement of water tightness due to its design type, then water entering the vehicle shall be drained adequately.	= requirement for doors (EN 4.10.2).

Verification				
Offer of Tenderer(s)	Design Review	FAI ¹	FII ²	Take-over
	X	X	X	
	X	X		
	X		X	
	X	X if no climate chamber for whole train	X	
	X	X	X	
	X	X	X	
	X		X	
	X		X	
	X	X	X	

ID	Requirement classification	Requirement text	Rationale
SLST.74	RE	The sliding step cassette shall be sealed tight against floor cleaning agents.	To prevent aggressive liquids from entering the step cassette and reaching the step components.
		6.3) Resistance against deformation	
SLST.75	RE	When a sliding step is used, no permanent deformation shall occur when a force of 1000 N is applied on either side of the sliding step, in x-direction.	Deformation in direction perpendicular to sliding step movement not covered by EN. Deformation in the horizontal plane must be prevented, to ensure that the sliding step will always extend and retract correctly and to prevent rotation and plastic deformation in time. The 1000N has been based on expert judgement.
SLST.76	RE	While extended, the sliding step shall stay in position under a force of up to 1200 N exerted on the edge of the sliding step in positive and negative y-direction.	Objective: 1) Demonstrate that in the extended position, pushing and pulling from front edge does not have an influence on the stability, i.e. the step should not move more than x mm from the position it has at the platform. 2) Application of force shall not have an influence on functionality afterwards. Force is defined to design the sliding step and its required strength at the extended position. 1200 N is a measure for verification.
SLST.77	RE	When retracted, the sliding step shall resist: - 1200N force in opening direction (positive y-direction); - dynamic and aerodynamic forces during operation (refer to annex F of EN14752); without loss of functionality after the forces have occurred.	The sliding step must remain retracted during all train movements.

Verification				
Offer of Tenderer(s)	Design Review	FAI ¹	FII ²	Take-over
	X		X	
	X	X	X depending on construction	
	X	X	X depending on construction	
	X	X	X depending on construction	

ID	Requirement classification	Requirement text	Rationale	Verification				
				Offer of Tenderer(s)	Design Review	FAI ¹	FII ²	Take-over
SLST.78	INFO	Requirements SLST.79 to SLST.82 are only applicable if the surface of the sliding step cassette is part of the standing area, i.e. the vehicle floor.	n/a					
SLST.79	RE	When a distributed load of 10 kN/m ² is applied on the entire surface of the sliding step cassette, the step shall extend or retract normally.	Case of overloaded train.		X	X	X depending on construction	
SLST.80	RE	A distributed load of 10 kN/m ² applied on the entire surface of the sliding step cassette shall not lead to permanent deformation.	Case of overloaded train.		X	X	X	
SLST.81	RE	When a load of 2.5 kN is applied on a 100x200 mm area, at any point of the sliding step cassette surface, the step shall extend or retract normally.	Case of heavy person standing on one leg.		X	X	X depending on construction	
SLST.82	RE	A load of 2.5 kN applied on a 100x200 mm area at any point of the sliding step cassette surface shall not lead to permanent deformation.	Case of heavy person standing on one leg.		X	X	X	
		7) Design requirements						
		7.1) General requirements						
SLST.83	RE	The sliding step shall have an electric drive system.	Advantages w.r.t. pneumatic systems: - better safety performance; - cheaper; - higher energy efficiency.	X	X	X		
SLST.84	OSRE	The sliding step shall have a step surface with: a) 15 x 15 mm grid; <i>or</i> b) chequered plate; <i>or</i> c) rough surface.	Operator must specify, as different operators have different experiences with e.g. snow or sand.	X depending on construction	X	X		
		7.2) Design for maintainability						
SLST.85	RE	The sliding step cassette containing all the step components shall be an exchangeable unit.	Good maintainability.		X	X		

ID	Requirement classification	Requirement text	Rationale	Verification				
				Offer of Tenderer(s)	Design Review	FAI ¹	FII ²	Take-over
SLST.86	RE	The connection between sliding step cassette and vehicle shall be a detachable connection.	With the designs currently available, the connection and its surrounding is usually broken when removing the cassette. This is undesirable.		X		X	
SLST.87	RE	All sliding steps on the same train shall use the same components and systems. Exceptions shall be brought to the attention of the operator during the design phase.	Standardisation. Reducing the variety of components is in fact applicable to all systems of the train but stated here explicitly.		X			
SLST.88	RE	All components shall be exchangeable separately in situ. The step drive shall not be considered as 1 component, hence all individual components shall be exchangeable in situ.	Depending on the overhaul and maintenance concept, and depending on the task, repairs are carried out in situ or at a depot. The design of the sliding step should allow for both options.		X	X	X	
SLST.89	RE	Exchange of the limit switch shall not require readjustment of the switch nor other step components.	Easy exchange of components.		X	X		
SLST.90	RE	Exchange of components shall be possible without special tools.	Standardisation.		X	X		
SLST.91	RE	All step components to be accessed during maintenance shall be accessible within 60 s, by one person and without special tools.	Good accessibility of components.		X	X	X	
SLST.92	RE	After maintenance, the original state of the sliding step shall be restorable within 60 s, by one person and without special tools.	Addition to SLST.91.		X	X	X	
SLST.93	RE	At least the following components shall be durably labelled with at least the manufacturer's name, the product name and the part/order number of the component: - drive system(s) - locking system(s) - step cassette(s) - step(s).	Traceability of components, facilitate procurement.		X	X		
SLST.94	RE	The component label shall only be visible to maintenance personnel.	Passenger perception.		X		X	
SLST.95	RE	The component label shall be visible without disassembly or removal of the component.	Improved maintainability.		X		X	

ID	Requirement classification	Requirement text	Rationale
SLST.96	RE	In case contrasting stripes are glued, they shall be glued on a dismantable component to facilitate their replacement (in less than 10 min).	Colour wears off quickly. Removal by scratching off in situ takes too long in case of glued stripes.
		7.3) Moisture resistant design	
SLST.97	RE	The sliding step cassette shall prevent the accumulation of fluids inside the cassette.	A dry cassette interior is the most desirable situation.
SLST.98	RE	If drainage holes are necessary, they shall be located such that water cannot enter the sliding step cassette through them due to e.g. overpressure.	Prevention of moisture accumulation may be (but does not have to be) realized by planning drainage holes.
SLST.99	RE	The wiring of the electrical components shall be placed such a way that water is prevented from entering electrical components.	Water and electricity do not go together. The requirement is non-functional as it is derived from operator experience.
SLST.100	RE	The tightness level of switches and control equipment of the sliding step shall be at least IP 66 as defined in EN 60 529.	Water and electricity do not go together. The requirement is non-functional as it is derived from operator experience.
		8) Diagnosis	
SLST.101	RE	In single and multiple train formations, each sliding step shall generate status information (out of service, extended, retracted) which is accessible for local use or network systems.	Operator may have requirements for the visualisation of information for the driver and train staff. The actual interface is out-of-scope and therefore not mentioned here.
SLST.102	RE	The sliding step control unit shall not be part of the central train network.	Undesired system architecture (authorisation!).
SLST.103	OSRE	The sliding step control unit shall be: a) integrated into the door control unit <u>or</u> b) communicate directly with the door control unit.	Option a), the 2-in-1 solution, is not acceptable for all operators at this point.
SLST.104	RE	The sliding step shall have the interfaces to be integrated into the diagnostic architecture of the vehicle.	Step and vehicle should follow the same logic.

Verification				
Offer of Tenderer(s)	Design Review	FAI ¹	FII ²	Take-over
	X	X		
	X		X	
	X		X	
	X	X	X	
	X	X		
	X		X	
	X		X	
X if not specified by operator	X		X	
	X		X	

ID	Requirement classification	Requirement text	Rationale	Verification				
				Offer of Tenderer(s)	Design Review	FAI ¹	FII ²	Take-over
SLST.105	RE	The system shall record for each sliding step: - number of operation cycles (continuous); - number of operation cycles, resettable by maintenance staff; - number of operation cycles between malfunctions; - number of operation cycles without malfunctions since the last software update; - operating hours (day and time); - average number of reversions.	To follow RAMS performance and (later) allocate a malfunction to an amount of cycles. "Malfunction" to be defined by operator.	X	X		X	
SLST.106	RE	The system shall measure per cycle for each sliding step, but record only when out of range: - the motor current curve (actual and target values); - the motor voltage curve (actual and target values); - the path-time-curve (actual and target values); - the activation of switches.	To ensure the step is prepared for future developments regarding preventive/condition-based maintenance.					
SLST.107	RE	The system shall record per cycle for each sliding step after activation by maintenance staff: - final position.	To ensure the step is prepared for future developments regarding preventive/condition-based maintenance. This functionality is to be switched on by maintenance staff (thus standard setting is "off").					
SLST.108	RE	The supplier shall determine the parameters to be transmitted for diagnostic purposes together with the operator.	Standardisation.		X			

ID	Requirement classification	Requirement text	Rationale	Verification				
				Offer of Tenderer(s)	Design Review	FAI ¹	FII ²	Take-over
SLST.109	RE	<p>The sliding step shall give information to the train network about any unexpected movement in extending direction, while the train is running, or in stations. The driver shall be informed immediately in case of:</p> <ul style="list-style-type: none"> - steps extending while train is running. - steps extending on the wrong side when the train stops at a station. <p>Note: The wrong side is the opposite of the authorized side, given by a system or a driver command.</p> <p>The supplier shall agree with the operator how this information is presented to the driver and/or train staff.</p>	<p>Make sure that the non-exit side of the train is safely closed.</p> <p>Unexpected behaviour, case 1: step extends unexpectedly.</p>		X		X	
SLST.110	RE	<p>The sliding step shall give information to the train network about unexpected behaviour in stations. The driver shall be informed immediately when a sliding step does not extend on the authorized side.</p> <p>The supplier shall agree with the operator how this information is presented to the driver and/or train staff.</p>	<p>Unexpected behaviour, case 2: step does not extend despite authorisation.</p>		X		X	
		9) Maintenance requirements						
SLST.111	RE	<p>The sliding step shall fully extend or retract when a local command is given by authorized personnel (e.g. for cleaning or maintenance purposes). The exact function shall be defined with the operator in the design phase.</p>	<p>Functionality depends on maintenance and cleaning concept of the operator. The supplier must take this into account in the early stages of the design.</p>		X		X	

ID	Requirement classification	Requirement text	Rationale
SLST.112	RE	The supplier shall supply complete maintenance instructions for all maintenance activities during the life of the sliding step, including the replacement interval of the rubber parts.	Rubber parts are considered the most vulnerable. The sliding step shall be designed to facilitate maintenance and to align with the existing maintenance regime of the operator. Detailed maintenance instructions includes all preventive- and corrective maintenance activities, including replacement of broken components caused by vandalism.
SLST.113	RE	The supplier shall provide the result of life endurance testing of: - the limit switch; - the motor; - the sensors of the contactless platform detection system, if applicable.	The results of these tests can be taken into account by the operator when writing the maintenance plan.
SLST.114	RE	The supplier shall provide an illustrated spare parts catalogue with engineering drawings of all spare parts.	Useful for maintenance organisation of the operator.

Verification				
Offer of Tenderer(s)	Design Review	FAI ¹	FII ²	Take-over
	X	X		
	X	X		
		X		

7 APPENDIX

Table 2 List of ID's or sections of the specifications which have to be set by the operator.

OSRE	OR	other
SLST.9	SLST.43	Subsection 3.3.2
SLST.10	SLST.46	Section 3.5
SLST.13		
SLST.15		
SLST.20		
SLST.22		
SLST.24		
SLST.25		
SLST.26		
SLST.30		
SLST.31		
SLST.34		
SLST.42		
SLST.52		
SLST.53		
SLST.55		
SLST.84		
SLST.103		

8 BIBLIOGRAPHY

The following referenced documents are indispensable for the application of this document. ENs are developed by CEN⁵ or CENELEC⁶ and are made available from their members. The Technical Specification for Interoperability (TSI) are specifications drafted by the European Railway Agency and adopted in a Decision by the European Commission, to ensure the interoperability of the trans-European rail system. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

1302/2014/EU	COMMISSION REGULATION (EU) No 1302/2014 of 18 November 2014 concerning a technical specification for interoperability relating to the 'rolling stock — locomotives and passenger rolling stock' subsystem of the rail system in the European Union. Published 12/12/2014.
1300/2014/EU	COMMISSION REGULATION (EU) No 1300/2014 of 18 November 2014 on the technical specifications for interoperability relating to accessibility of the Union's rail system for persons with disabilities and persons with

⁵ Comité Européen de Normalisation/ European Committee for Standardization - www.cen.eu

⁶ Comité Européen de Normalisation Électrotechnique/ European Committee for Electrotechnical Standardization - www.cenelec.eu

	reduced mobility. Published 18/11/2014.
EN 14 752	Railway applications - Bodyside entrance systems for rolling stock
EN 16 584-1	Railway applications - Design for PRM Use - General requirements - Part 1: Contrast
EN 16 584-3	Railway applications - Design for PRM Use - General requirements - Part 3: Optical and friction characteristics
EN 50 125	Railway applications - Environmental conditions for equipment - Part 1: Rolling stock and on-board equipment
EN 50 155	Railway applications - Electronic equipment used on rolling stock
prEN 16 251	Railway application - Environmental conditions - Design and test of rolling stock under severe conditions
EN 60 529	Degrees of protection provided by enclosures (IP code) (IEC 60529:1989 + A1:1999)

EuroSpec

“EuroSpec” stands for European Specifications for railway rolling stock. The activity is an initiative of several European train operating companies (TOC). The main focus is on trains consisting of self-propelled carriages, using electricity as the motive power (EMU).

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